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World Oil Transit Chokepoints

The following presents information on major world oil transit centers. Over 35 million barrels per day (bbl/d) pass through the relatively narrow shipping lanes and pipelines discussed below. These routes are known as chokepoints due to their potential for closure. Disruption of oil flows through any of these export routes could have a significant impact on world oil prices.

The information in this report is the best available as of November 2002 and is subject to change.

GENERAL BACKGROUND

Given the fact that oil consumption occurs mainly in the industrialized West, while oil production takes place largely in the [Middle East](#), [former Soviet Union](#), [West Africa](#), and [South America](#), a significant volume of oil is traded internationally. This oil is moved mainly by two methods: oil tanker ships and oil pipelines. More than three-fifths moves by sea and under two-fifths by pipeline. Tankers have made global (intercontinental) transport of oil possible; they are low cost, efficient, and extremely flexible.

Pipelines, on the other hand, are the mode of choice for transcontinental oil movements. Pipelines are critical for landlocked crudes and also complement tankers at certain key locations by relieving bottlenecks or providing

shortcuts. Pipelines come into their own in intra-regional trade. They are the primary option for transcontinental transportation, because they are at least an order of magnitude cheaper than any alternative such as rail, barge, or road, and because political vulnerability is a small or non-existent issue within a nation's border or between neighbors such as the United States and Canada. (Pipelines are also an important oil transport mode in mainland Europe, although the system is much smaller, matching the shorter distances.)

Oil transported by sea generally follows a fixed set of maritime routes. Along the way, tankers encounter several geographic "chokepoints," or narrow channels, such as the Strait of Hormuz leading out of the Persian Gulf and the Strait of Malacca linking the Indian Ocean (and oil coming from the Middle East) with the Pacific Ocean (and major consuming markets in Asia). Other important maritime "chokepoints" include the Panama Canal connecting the Pacific and Atlantic Oceans, the Suez Canal connecting the Red Sea and Mediterranean Sea, and the Bab el-Mandab passage from the Arabian Sea to the Red Sea. "Chokepoints" are critically important to world oil trade because so much oil passes through them, yet they are narrow and theoretically could be blocked -- at least temporarily. In addition, "chokepoints" are susceptible to pirate attacks and shipping accidents in their narrow channels.

According to Intertanko, the world tanker fleet as of January 2002 included approximately 3,500 ships. These range greatly in size and include: "Ultra Large Crude Carriers" (ULCCs) of more than 300,000 dead weight tons (DWT); "Very Large Crude Carriers" (VLCCs) from 200,000 to 300,000 DWT; "Suezmax" tankers between 125,000 and 180,000 DWT; "Aframax" tanker between 75,000 and 125,000 DWT; "Panamax" tankers of around 50,000 DWT; "Handymax" tankers of around 35,000 DWT; and "Handy Size" tankers of 20,000-30,000 DWT.

Not all tanker trade routes use the same size ship. Each route usually has one size that is the clear economic winner, based on voyage length, port and canal constraints and volume. Thus, crude exports from the Middle East -- high volumes that travel long distances -- are moved mainly by VLCC's typically

carrying over 2 million barrels of oil on every voyage. The VLCC's economies of scale outweigh the constraints imposed: they are too large for all the ports in the United States except the Louisiana Offshore Oil Port (LOOP). Thus, they must have some or all of their cargo transferred to smaller vessels, either at sea (lightering) or at an offshore port (transshipment). In contrast, ships out of the Caribbean and South America are routinely smaller and enter ports in the United States directly. Because of such ship size differences, a long voyage can sometimes be cheaper on a per barrel basis than a short one.

The recent growth in United States dependence on its Western Hemisphere neighbors is an illustration of a "nearer-is-better" phenomenon. Western Hemisphere sources now supply around half of U.S. oil import volume, much of it on voyages of less than a week. Another quarter comes from elsewhere in the area called the Atlantic Basin -- those countries on both sides of the Atlantic Ocean. This oil, from West Africa and the North Sea mainly, takes just 2-3 weeks to reach the United States, and boosts the so-called short-haul share of U.S. imports to over three-quarters. Most North Sea and North and West African crude oils stay in the Atlantic Basin, moving to Europe or North America on routes that rarely take over 20 days. In contrast, voyage times to Asia for just the nearest of these, the West African crude oils, would be over 30 days to Singapore, rising to nearly 40 for Japan. Not surprisingly, therefore, most of Asia's oil comes instead from the Middle East, only 20-30 days away.

Bab el-Mandab

Location: Djibouti/Eritrea/Yemen; connects the Red Sea with the Gulf of Aden and the Arabian Sea

Oil Flows (2000E): 3.2-3.3 million bbl/d

Destination of Oil Exports: Europe, United States, Asia

Concerns/Background: Closure of the Bab el-Mandab could keep tankers from the Persian Gulf from reaching the Suez Canal/Sumed Pipeline complex,

diverting them around the southern tip of Africa (the Cape of Good Hope). This would add greatly to transit time and cost, and effectively tie up spare tanker capacity. In December 1995, Yemen fought a brief battle with Eritrea over Greater Hanish Island, located just north of the Bab el-Mandab. The Bab el-Mandab could be bypassed (for northbound oil traffic by utilizing the East-West oil pipeline, which traverses [Saudi Arabia](#) and has a capacity of about 4.8 million bbl/d. However, southbound oil traffic would still be blocked. In addition, closure of the Bab el-Mandab would effectively block non-oil shipping from using the [Suez Canal](#), except for limited trade within the Red Sea region.

In early October 2002, A French VLCC (Very Large Crude Carrier) chartered by Malaysian state oil company Petronas was attacked by terrorist suicide bombers off the coast of Yemen, seriously damaging the ship and killing one crew member. The VLCC, known as the Limburg, had about 400,000 barrels of oil aboard, and was on its way to load additional oil in Yemen when attacked. The attack on the Limburg prompted a warning by the U.S. Navy's Maritime Liaison Office in Bahrain, stating that "Shipmasters should exercise extreme caution when transiting...strategic chokepoints such as the Strait of Hormuz, or Bab el-Mandeb, or...[other] traditional high-threat areas such as along the Horn of Africa." Following the attack, al-Qaeda issued a statement which warned that the attack on the Limburg "was not an incidental strike at a passing tanker but...on the international oil-carrying line in the full sense of the word."

In the aftermath of the Limburg attack, as well as threats by al-Qaeda against oil infrastructure in the Persian Gulf region, *Lloyd's List* reported that several area states were heightening security measures around crude facilities along their coastlines and elsewhere.



Bosporus/Turkish Straits

Location: [Turkey](#); this 17-mile long waterway divides Asia from Europe and connects the Black Sea with the Mediterranean Sea

Oil Flows (2001E): 2.0 million bbl/d (nearly all southbound; mostly crude oil with several hundred thousand barrels per day of

products as well)

Destination of Oil Exports: Western and Southern [Europe](#);

Concerns/Background: Only half a mile wide at its narrowest point, the Turkish Straits are one of the world's busiest (50,000 vessels annually, including 5,500 oil tankers), and most difficult-to-navigate waterways. Many of the proposed export routes for forthcoming production from the [Caspian Sea region](#) pass westwards through the Black Sea and the Turkish Straits en route to the Mediterranean Sea and world markets. The ports of the Black Sea, along with those in the Baltic Sea, were the primary oil export routes of the former Soviet Union, and the Black Sea remains the largest outlet for [Russian oil exports](#).

Under the Montreux Convention of 1936, commercial shipping has the right of free passage through the Bosporus and Turkish Straits in peacetime, although Turkey claims the right to impose regulations for safety and environmental purposes. In October 2002, for instance, Turkey placed new restrictions on oil tanker transit through the Bosporus, including: a ban on nighttime transit for ships longer than 200 meters; a requirement that ships carrying dangerous cargo (including oil) request permission to transit 48 hours in advance; and a one-way traffic regulation on ships more than 250-300 meters long or carrying liquefied natural gas (LNG) or liquefied petroleum gas (LPG). The regulations reportedly have slowed tanker transit by as much as 3 1/2 days.

Exports through the Turkish Straits have grown since the breakup of the Soviet Union in 1991, and there is growing concern that projected Caspian Sea export volumes exceed the ability of the Turkish Straits to accommodate the tanker traffic. Turkey is concerned that the projected increase in large oil tankers would pose a serious navigational safety and environmental threats to the Turkish Straits. In July 2000, the International Energy Agency estimated that exports through the Black Sea could reach 2.3 million bbl/d, but that the Turkish Straits could handle only 1.8 million bbl/d maximum.



Panama Canal and Trans-Panama Pipeline

Location: Panama; connects the Pacific Ocean with the Caribbean Sea and Atlantic Ocean

Oil Flows (2001E): 613,000 bbl/d

Concerns/Background: The Panama Canal extends approximately 50 miles from

Panama City on the Pacific Ocean to Colon on the Caribbean Sea. In fiscal year (FY) 2001, petroleum and petroleum products was the largest commodity (by tonnage) shipped through the Canal, accounting for 16% of total canal shipments. Around 64% of total oil shipments went south from the Atlantic to the Pacific, with oil products dominating southbound traffic. Chemicals (including petrochemicals) and coal are shipped through the canal as well, accounting for 5% and 3%, respectively, of total Canal traffic. The largest vessel that can transit the Panama Canal is known as a PANAMAX-size vessel. A long-term program is underway to widen the narrow, eight-mile stretch of Gaillard Cut to allow unrestricted two-way traffic of PANAMAX-size vessels.

If transit were halted through the Canal, the Trans-Panama pipeline (Petroterminal de Panama, S.A.) could be re-opened to carry oil in either

direction. This pipeline is located outside the former Canal Zone near the Costa Rican border, and runs from the port of Charco Azul on the Pacific Coast (near Puerto Armuelles, southwest of David) to the port of Chiriqui Grande, Bocas del Toro on the Caribbean. It was opened in October 1982 as an economical alternative to the Panama Canal for transporting Alaskan oil across Panama en route to Gulf Coast ports. Transit time from Alaska to the U.S. Gulf Coast via Panama is about 16 days, whereas a tanker would take 40 days to reach the Gulf Coast from Alaska if rerouted around Cape Horn (the southern tip of South America). To date, more than 2.2 billion barrels of Alaskan crude oil has been transported through the 81-mile pipeline. However, the 860,000-bbl/d pipeline was closed in April 1996 after Alaskan oil shipments to the Gulf Coast declined with falling Alaskan oil production (Alaska now produces about 1 million bbl/d) and increased oil consumption on the west coast of the United States, especially in California. In addition, the decision to allow Alaskan oil to be exported outside the United States reduced the incentives to ship Alaskan oil to the Gulf Coast. There has been some discussion of reversing the direction of the pipeline to allow Caribbean oil producers a less expensive outlet to Pacific destinations.

The United States is not heavily reliant on the Panama Canal for its petroleum imports. In 2001, only 1.7% of total U.S. petroleum imports (crude oil plus petroleum products) transited the Canal en route to American ports (see table). On the whole, much more crude oil destined for U.S. shores passes through the Canal than do petroleum products. However, as a share of U.S. imports, the Canal is far more important for imported petroleum products. In 2001 only 0.8% of imported crude oil came to the United States through the Panama Canal, compared to approximately 8% of imported petroleum products. The United States imports slightly less oil through the Canal than 20 years ago, and no longer relies heavily on the Canal to move oil from one coast to the other.

Russian Oil and Gas Export Pipelines/Ports

Location: Russian oil and gas exports transit via pipelines that pass through Russia, Ukraine, Belarus, Hungary, Slovakia, the Czech Republic, and Poland,

Major Oil Export Ports: Novorossiisk (Russia -- Black Sea); Primorsk (Russia -- Baltic Sea/Gulf of Finland); Tuapse (Russia); Ventspils (Latvia); Odessa (Ukraine)

Major Oil Pipelines (capacity, 2002E): Druzhba (1.2 million bbl/d); Baltic Pipeline System (240,000 bbl/d); CPC Tengiz-Novorossiisk Pipeline (564,000 bbl/d, most of which is Kazakh crude)

Major Natural Gas Pipelines (capacity, 2002E): Brotherhood, Progress, and Union (1 trillion cubic feet -- tcf -- capacity each); Northern Lights (0.8 tcf); Volga/Urals-Vyborg, Finland (0.1 tcf). Yamal (to Europe, via Belarus; 1.0 Tcf, partly operational); Blue Stream (to Turkey via Black Sea; 0.56 Tcf, construction completed in October 2002)

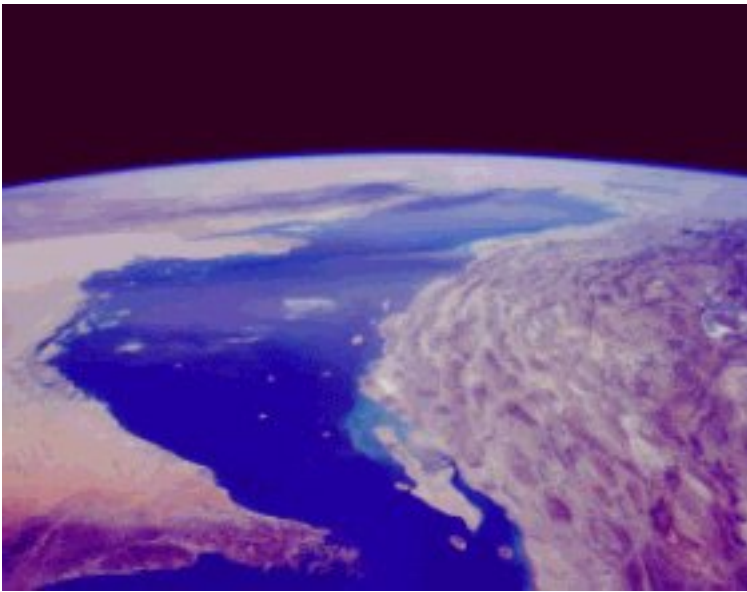
Destination of Oil and Gas Exports: Eastern Europe, Netherlands, Italy, Germany, France, other Western Europe.

Concerns/Background: Russia is a major supplier of crude oil and natural gas to Europe. All of the ports and pipelines are operating at or near capacity, leaving limited alternatives if problems arose at Russian export terminals. In addition, many of the country's oil pipelines are in a state of disrepair, and Russian Energy Ministry figures indicate that almost 5% of crude oil produced in Russia is lost through illegal tapping of Russia's pipelines. With a windfall in oil export tariffs over the past several years, Transneft, the state oil transport monopoly, has taken steps to upgrade the country's pipeline system, with an emphasis on building new export pipelines to increase and diversify export routes for oil exporters. In addition to increasing capacity at Novorossiisk, the country's main oil terminal on the Black Sea, Transneft is constructing the Baltic Pipeline System, working to integrate the Druzhba and Adria pipelines to allow Russian oil to be exported via the Adriatic Sea, and looking to construct a pipeline to China. Russia also is seeking to lure additional transit oil from Azerbaijan, Kazakhstan, and Turkmenistan. Russian oil majors have proposed the construction of a deepwater oil terminal at Murmansk that would allow oil to be exported economically from

West Siberia to the United States, although the earliest possible date for completion of the terminal would be 2005.

In October 2000, Russian oil company Yukos announced plans to integrate the Druzhba southern pipeline with the Adria pipeline, which runs from the Adriatic port of Omisalj in Croatia to Hungary. Yukos signed a \$20 million agreement with Croatian oil transport company Jadranski Naftovod to modernize the Adria pipeline to help integrate the two pipelines. By reversing the flows of the 110-mile pipeline between Omisalj and Sisak, the integration of the Druzhba and Adria pipelines will allow direct exports of Russian oil to the coast of the Adriatic Sea. With the line reversed to Omisalj, Russian oil exporters will have direct access to the Mediterranean Sea, allowing them to bypass the Black Sea and the increasingly crowded Bosphorus Straits. The entire Druzhba-Adria pipeline route would handle 100,000 bbl/d in 2003, the first full year of operation. Transneft and Jadranski Naftovod have said that exports via the pipeline would rise to 200,000 bbl/d after five years, and to 300,000 bbl/d after 10 years.

Nearly 90% of Russia's natural gas exports to Europe are routed through Ukraine. In an effort to diversify its export routes, as well as reach new markets, Russia is planning to build several new natural gas export pipelines. The Blue Stream pipeline to Turkey is the centerpiece of Russia's export diversification strategy. Construction on the 565-Bcf-capacity pipeline, which consists of twin pipelines laid on the bottom of the Black Sea, was completed in October 2002; Blue Stream should be operational by the end of 2002.



Strait of Hormuz

Location: Oman/Iran; connects the Persian Gulf with the Gulf of Oman and the Arabian Sea

Oil Flows (2002E): 13 million bbl/d

Destination of Oil Exports: Japan, United States, Western Europe

Concerns/Background: By far the world's most important oil

chokepoint, the Strait consists of 2-mile wide channels for inbound and outbound tanker traffic, as well as a 2-mile wide buffer zone. Closure of the Strait of Hormuz would require use of longer alternate routes (if available) at increased transportation costs. Such routes include the 5 million-bbl/d capacity Petrolina (East-West Pipeline) and the 290,000-bbl/d Abqaiq-Yanbu natural gas liquids line across Saudi Arabia to the Red Sea. Theoretically, the 1.65-million bbl/d Iraqi Pipeline across Saudi Arabia (IPSA) also could be utilized, more oil could be pumped north to Ceyhan (Turkey), and the 0.5 million-bbl/d Tapline to Lebanon could be reactivated.

Strait of Malacca

Location: Malaysia/Singapore; connects the Indian Ocean with the South China Sea and the Pacific Ocean.

Oil Flows (2002E): 10.3 million bbl/d

Destination of Oil Exports: Japan, South Korea, China, other Pacific Rim countries.

Concerns/Background: The Strait of Malacca, linking the Indian and Pacific Oceans, is the shortest sea route between three of the world's most populous countries -- India, China, and Indonesia -- and therefore is considered to be the key choke point in Asia. The narrowest point of this shipping lane is the Phillips Channel in the Singapore Strait, which is only 1.5 miles wide at its

narrowest point. This creates a natural bottleneck, with the potential for a collision, grounding, or oil spill (in addition, piracy is a regular occurrence in the Singapore Strait). If the strait were closed, nearly half of the world's fleet would be required to sail further, generating a substantial increase in the requirement for vessel capacity. All excess capacity of the world fleet might be absorbed, with the effect strongest for crude oil shipments and dry bulk such as coal. Closure of the Strait of Malacca would immediately raise freight rates worldwide. More than 50,000 vessels per year transit the Strait of Malacca. With Chinese oil imports from the Middle East increasing steadily, the Strait of Malacca is likely to grow in strategic importance in coming years.

The bombing in October 2002 of a nightclub on the Indonesian island of Bali raised concerns throughout the region that other targets -- including oil transit "chokepoints" like the Strait of Malacca -- could be targeted by terrorists as well. As of early November 2002, insurance rates had not been affected for tankers traveling through the Straits, but insurance companies did place a "war-risk" designation on Indonesian ports, which means that ships docking at those ports forfeit their insurance coverage. Reportedly, Singapore and Malaysia have begun escorting oil tankers and increasing naval patrols in their waters, but this has not eliminated the threat of terrorism in the region's shipping channels.



Source: Oil Capital Ltd.

Suez Canal and Sumed Pipeline

Location: Egypt; connects the Red Sea and Gulf of Suez with the Mediterranean Sea

Oil Flows (2001E/2002E): 3.8 million bbl/d. Of this total, the Sumed Pipeline transported 2.5 million bbl/d of oil northbound (nearly all from Saudi Arabia) and the Suez Canal around 1.3 million bbl/d total.

Destination of Sumed Oil Exports:

Predominantly Europe; also United States.

Concerns/Background: Closure of the Suez Canal and/or Sumed Pipeline would divert tankers around the southern tip of Africa (the Cape of Good Hope), adding greatly to transit time and effectively tying up tanker capacity.

The Suez Canal transported around 1.3 million bbl/d of petroleum in 2001. Southbound trade consisted of about 300,000 bbl/d of petroleum, over 80% of which was refined products and the rest crude oil. Northbound trade consisted of about 955,000 bbl/d of petroleum, around 60% of which was crude oil. For the first eight months of 2001, an average of about 238 oil tankers passed through the Suez Canal each month, 20% of the total, and significantly below the canal's capacity. Currently, the Suez Canal can accommodate ships with drafts of up to 58 feet, which means that very large crude carriers (VLCCs) and ultra large crude carriers (ULCCs) cannot pass through the Canal. The Egyptian government plans to widen and deepen the Suez Canal, so that by 2010 it can accommodate VLCCs and ULCCs. In 2001, the Suez Canal Authority (SCA) launched a 5-year program to reduce tanker transit times (from 14 hours to 11 hours) through the Canal. The SCA also is moving ahead with a project to widen and deepened the Canal to allow for transit of larger ships than the 200,000-dead-weight-ton maximum now.

The Sumed pipeline, with capacity of around 2.5 million bbl/d, links the Ain Sukhna terminal on the Gulf of Suez with Sidi Kerir on the Mediterranean. Sumed consists of two parallel 42-inch lines, and is owned by Arab Petroleum

Pipeline Co., a joint venture of EGPC, Saudi Aramco, Abu Dhabi's ADNOC, three Kuwaiti companies, and Qatar's QGPC.

Sources for this report include: APS Review Oil Market Trends; Australian Financial Review; Business Week Online; Central Intelligence Agency; Energy Compass; Intertanko; Lloyd's List; National Defense University ("Chokepoints: Maritime Concerns in Southeast Asia"); National Post; Office of Naval Intelligence ("The Strait of Hormuz," "The Suez Canal/Sumed Complex"), Oil Daily; Platt's Oilgram News; Reuters; U.S. Energy Information Administration

LINKS

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[EIA - Oil Market Basics \(trade\)](#)

[Energy Supply Security](#) - The latest information on events that could affect energy security

[Panama](#)

[Oil Market Basics: Transportation](#)

[Russian Oil and Gas Exports Fact Sheet](#)

[World Crude Oil Flows 1997 - Map](#)

Links to other U.S. government sites:

[National Defense University, Institute for National Strategic Studies](#) - The South China Sea

[National Defense University, Institute for National Strategic Studies](#) - Southeast Asian Chokepoints

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